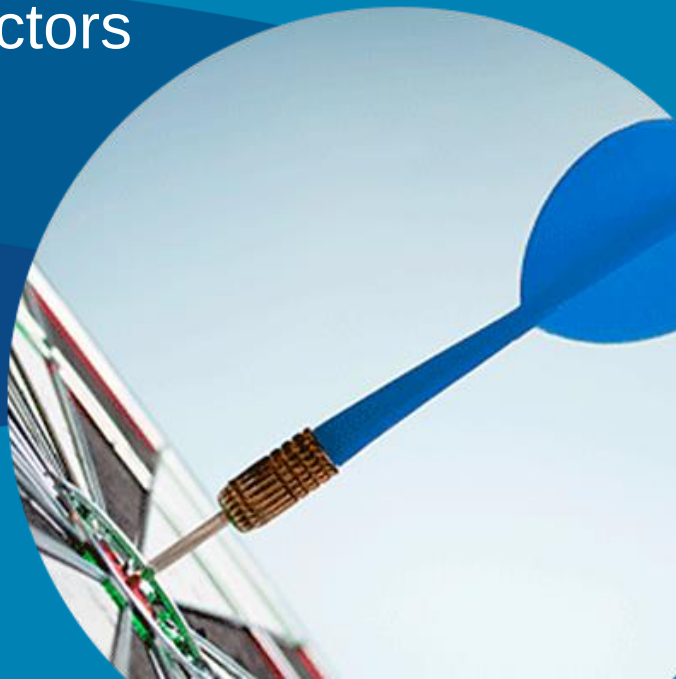
Michigan State Employees' Retirement System (SERS)

Review of Optional Forms of Payment Factors

November 1, 2018



Introduction

- Normal form of payment for a member who retires is a straight life benefit
- Section 31 of the SERS statute allows the member to choose an optional form of payment by having the member's computed benefit reduced
  - 100% joint and survivor with pop-up
  - 75% joint and survivor with pop-up
  - 50% joint and survivor with pop-up
- Section 20 of the SERS statute allows the member to choose a Social Security equated optional form of payment
- If a member chooses an optional form of payment, an "option factor" is applied to the member's computed benefit

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Introduction (Continued)

- Social Security Equated Option
  - For those age 65 or younger, a Social Security equated option at age 65 in a straight life form or in conjunction with a joint and survivor option
  - Retiree is paid an increased benefit from the plan until age 65 when it is reduced based on the projected Social Security benefit
  - Intent is that the increased benefit from the plan before age 65 approximates the same level of benefits as the plan plus Social Security after age 65

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Introduction (Continued)

- Section 31 of the SERS statute indicates that the joint and survivor options shall be the "actuarial equivalent" of the straight life option
  - Section 20 the statute indicates that the adjustment for the Social Security equated option shall be "equated on an actuarial basis"
  - Actuarial equivalent means that the optional forms of payment are "cost neutral" based upon a set of actuarial assumptions
  - That is, if all assumptions that the option factors are based upon are met, SERS is not financially affected by the selection of payment form by the member

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Introduction (Continued)

- Actuarial equivalent (i.e., cost neutral) option factors are generally dependent upon the following:
  - Life expectancies of the retiree and beneficiary
  - Interest rate assumption
  - COLA assumption
  - Proportion of male/female retirees choosing the options
    - Cannot charge a different option factor based upon a member's gender

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Introduction (Continued)

- Public Act 336 of 2018 grants the Department and the Retirement Board the authority to set the assumed rate of return and mortality tables associated with actuarial equivalence for optional forms of payment
- Reasonable to review the option factors based upon the results of the recently completed 5-year Experience Study to see if the option factors should be updated

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Introduction (Concluded)

- The choice of a set of option factors is based upon judgement
  - Considerations include:
    - System's objectives
    - Anti-selection
    - Whether the proposed factors are different enough to pursue a change
- The choice of assumptions may affect other individual actuarial calculations such as EDROs, recoupment calculations, and service purchases

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Current Option Factors

- ORS provided the joint and survivor and the Social Security equated optional form factors currently in use
  - ORS currently uses the same joint and survivor optional form factors for all systems (i.e., MPSERS, SERS, SPRS, and JRS)
- GRS reasonably approximated the current joint and survivor factors using the following actuarial basis:
  - 8.00% interest rate
  - 1983 Group Annuity Mortality Table
  - 100% unisex (i.e., retiree assumed to be 100% male; beneficiary the opposite)
  - No COLA
  - No charge for the pop-up provision

Current Option Factors

- GRS reasonably approximated the current Social Security equated factors using the following actuarial basis:
  - 8.00% interest rate
  - 1971 Group Annuity Mortality Table
  - 74% unisex (i.e., retiree assumed to be 74% male / 26% female; beneficiary the opposite)
  - No COLA

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Current 100% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	90.9%	91.4%	91.9%	92.4%	93.0%	93.5%	94.0%	94.5%	95.0%	95.4%	95.8%
51	90.1%	90.7%	91.2%	91.8%	92.4%	92.9%	93.5%	94.0%	94.5%	95.0%	95.4%
52	89.3%	89.9%	90.5%	91.1%	91.7%	92.3%	92.9%	93.4%	94.0%	94.5%	95.0%
53	88.5%	89.1%	89.7%	90.3%	91.0%	91.6%	92.2%	92.8%	93.4%	94.0%	94.6%
54	87.6%	88.2%	88.8%	89.5%	90.2%	90.9%	91.5%	92.2%	92.8%	93.5%	94.0%
55	86.6%	87.3%	87.9%	88.6%	89.3%	90.1%	90.8%	91.5%	92.2%	92.9%	93.5%
56	85.6%	86.2%	86.9%	87.7%	88.4%	89.2%	90.0%	90.7%	91.5%	92.2%	92.9%
57	84.4%	85.2%	85.9%	86.7%	87.4%	88.3%	89.1%	89.9%	90.7%	91.5%	92.2%
58	83.3%	84.0%	84.8%	85.6%	86.4%	87.2%	88.1%	89.0%	89.8%	90.6%	91.4%
59	82.0%	82.8%	83.5%	84.4%	85.2%	86.1%	87.0%	88.0%	88.9%	89.7%	90.6%
60	80.7%	81.4%	82.3%	83.1%	84.0%	84.9%	85.9%	86.9%	87.8%	88.8%	89.7%
61	79.3%	80.1%	80.9%	81.8%	82.7%	83.7%	84.7%	85.7%	86.7%	87.7%	88.7%
62	77.8%	78.6%	79.5%	80.4%	81.3%	82.3%	83.4%	84.4%	85.5%	86.6%	87.6%
63	76.3%	77.1%	77.9%	78.9%	79.9%	80.9%	82.0%	83.1%	84.2%	85.4%	86.5%
64	74.7%	75.5%	76.4%	77.3%	78.3%	79.4%	80.5%	81.7%	82.9%	84.0%	85.2%
65	73.0%	73.8%	74.7%	75.7%	76.7%	77.8%	79.0%	80.2%	81.4%	82.7%	83.9%
66	71.3%	72.1%	73.0%	74.0%	75.1%	76.2%	77.4%	78.6%	79.9%	81.2%	82.5%
67	69.6%	70.4%	71.3%	72.3%	73.4%	74.5%	75.8%	77.0%	78.3%	79.7%	81.1%
68	67.8%	68.6%	69.5%	70.6%	71.6%	72.8%	74.1%	75.4%	76.7%	78.1%	79.5%
69	66.0%	66.8%	67.7%	68.8%	69.8%	71.0%	72.3%	73.6%	75.0%	76.5%	78.0%
70	64.2%	65.0%	65.9%	66.9%	68.0%	69.2%	70.5%	71.9%	73.3%	74.8%	76.3%

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Current 75% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	93.0%	93.4%	93.8%	94.2%	94.6%	95.0%	95.4%	95.8%	96.2%	96.5%	96.8%
51	92.4%	92.8%	93.3%	93.7%	94.2%	94.6%	95.0%	95.4%	95.8%	96.2%	96.5%
52	91.8%	92.2%	92.7%	93.2%	93.6%	94.1%	94.6%	95.0%	95.4%	95.8%	96.2%
53	91.1%	91.6%	92.1%	92.6%	93.1%	93.6%	94.1%	94.5%	95.0%	95.4%	95.9%
54	90.4%	90.9%	91.4%	91.9%	92.5%	93.0%	93.5%	94.0%	94.5%	95.0%	95.5%
55	89.6%	90.1%	90.7%	91.2%	91.8%	92.4%	92.9%	93.5%	94.0%	94.5%	95.0%
56	88.8%	89.3%	89.9%	90.5%	91.1%	91.7%	92.3%	92.9%	93.5%	94.0%	94.6%
57	87.9%	88.4%	89.0%	89.6%	90.3%	90.9%	91.6%	92.2%	92.8%	93.4%	94.0%
58	86.9%	87.5%	88.1%	88.8%	89.4%	90.1%	90.8%	91.5%	92.2%	92.8%	93.4%
59	85.9%	86.5%	87.1%	87.8%	88.5%	89.2%	90.0%	90.7%	91.4%	92.1%	92.8%
60	84.8%	85.4%	86.1%	86.8%	87.5%	88.3%	89.0%	89.8%	90.6%	91.3%	92.1%
61	83.6%	84.3%	84.9%	85.7%	86.4%	87.2%	88.1%	88.9%	89.7%	90.5%	91.3%
62	82.4%	83.0%	83.8%	84.5%	85.3%	86.1%	87.0%	87.9%	88.7%	89.6%	90.4%
63	81.1%	81.8%	82.5%	83.3%	84.1%	85.0%	85.9%	86.8%	87.7%	88.6%	89.5%
64	79.7%	80.4%	81.2%	82.0%	82.8%	83.7%	84.6%	85.6%	86.6%	87.5%	88.5%
65	78.3%	79.0%	79.8%	80.6%	81.5%	82.4%	83.4%	84.4%	85.4%	86.4%	87.4%
66	76.8%	77.5%	78.3%	79.2%	80.1%	81.0%	82.0%	83.1%	84.1%	85.2%	86.3%
67	75.3%	76.0%	76.8%	77.7%	78.6%	79.6%	80.6%	81.7%	82.8%	84.0%	85.1%
68	73.7%	74.5%	75.3%	76.2%	77.1%	78.1%	79.2%	80.3%	81.5%	82.6%	83.8%
69	72.1%	72.9%	73.7%	74.6%	75.5%	76.6%	77.7%	78.8%	80.0%	81.3%	82.5%
70	70.5%	71.2%	72.0%	72.9%	73.9%	75.0%	76.1%	77.3%	78.5%	79.8%	81.1%

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Current 50% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	95.2%	95.5%	95.8%	96.1%	96.4%	96.6%	96.9%	97.2%	97.4%	97.6%	97.9%
51	94.8%	95.1%	95.4%	95.7%	96.0%	96.3%	96.6%	96.9%	97.2%	97.4%	97.7%
52	94.4%	94.7%	95.0%	95.3%	95.7%	96.0%	96.3%	96.6%	96.9%	97.2%	97.4%
53	93.9%	94.2%	94.6%	94.9%	95.3%	95.6%	96.0%	96.3%	96.6%	96.9%	97.2%
54	93.4%	93.7%	94.1%	94.5%	94.8%	95.2%	95.6%	95.9%	96.3%	96.6%	96.9%
55	92.8%	93.2%	93.6%	94.0%	94.4%	94.8%	95.2%	95.6%	95.9%	96.3%	96.6%
56	92.2%	92.6%	93.0%	93.4%	93.9%	94.3%	94.7%	95.1%	95.5%	95.9%	96.3%
57	91.6%	92.0%	92.4%	92.9%	93.3%	93.8%	94.2%	94.7%	95.1%	95.5%	95.9%
58	90.9%	91.3%	91.7%	92.2%	92.7%	93.2%	93.7%	94.2%	94.6%	95.1%	95.5%
59	90.1%	90.6%	91.0%	91.5%	92.0%	92.5%	93.1%	93.6%	94.1%	94.6%	95.1%
60	89.3%	89.8%	90.3%	90.8%	91.3%	91.9%	92.4%	93.0%	93.5%	94.1%	94.6%
61	88.4%	88.9%	89.4%	90.0%	90.5%	91.1%	91.7%	92.3%	92.9%	93.5%	94.0%
62	87.5%	88.0%	88.5%	89.1%	89.7%	90.3%	90.9%	91.6%	92.2%	92.8%	93.4%
63	86.5%	87.0%	87.6%	88.2%	88.8%	89.4%	90.1%	90.8%	91.4%	92.1%	92.7%
64	85.5%	86.0%	86.6%	87.2%	87.9%	88.5%	89.2%	89.9%	90.6%	91.3%	92.0%
65	84.4%	84.9%	85.5%	86.2%	86.8%	87.5%	88.3%	89.0%	89.8%	90.5%	91.3%
66	83.2%	83.8%	84.4%	85.1%	85.8%	86.5%	87.3%	88.0%	88.8%	89.6%	90.4%
67	82.0%	82.6%	83.3%	83.9%	84.6%	85.4%	86.2%	87.0%	87.9%	88.7%	89.5%
68	80.8%	81.4%	82.0%	82.7%	83.5%	84.3%	85.1%	86.0%	86.8%	87.7%	88.6%
69	79.5%	80.1%	80.8%	81.5%	82.2%	83.1%	83.9%	84.8%	85.7%	86.7%	87.6%
70	78.2%	78.8%	79.4%	80.2%	81.0%	81.8%	82.7%	83.6%	84.6%	85.6%	86.6%

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Current Social Security Equated Factors

- The table below shows the current Social Security equated optional form factors at integer ages only

Retiree Age	Factor
40	8.07%
41	9.39%
42	10.71%
43	12.03%
44	13.35%
45	14.67%
46	15.59%
47	17.44%
48	19.03%
49	20.79%
50	22.72%
51	24.85%
52	27.21%

Retiree Age	Factor
53	29.82%
54	32.72%
55	35.94%
56	39.52%
57	43.51%
58	47.98%
59	52.99%
60	58.61%
61	64.95%
62	72.11%
63	80.23%
64	89.46%

Example

- Member retires at age 60 with a $10,000 annual benefit
  - Spouse is the same age
  - Member chooses 100% joint and survivor with pop-up
  - Member's benefit becomes $8,490 ($10,000 x 84.9%)
    - Reduction in member's benefit of $1,510 makes up for the longer period of time over which the pension is expected to be paid
    - If member predeceases spouse, spouse receives $8,490 (COLAs would affect actual benefit at time of death)
    - If spouse predeceases member, member's benefit increases (i.e., pops-up) to $10,000 (COLAs would affect actual benefit at time of death)

Option Election Experience – Last 5 Years

- GRS analyzed service-based retirements since October 1, 2012 contained in the September 30, 2017 actuarial valuation data
  - No death-in-service or disability retirements considered
  - Election of a joint and survivor option includes both Social Security equated elections and standard elections
  - Only considered records in which retiree was still alive
  - 8,587 retirements met above criteria

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Option Election Experience – Last 5 Years

- The results are as follows:
  - Of the 4,542 retirees electing joint and survivor options, approximately 40% are female and 60% are male
  - Existing defined benefit active population is approximately 52% female and 48% male
  - The average benefit at retirement for the 8,587 new retirements (noted above) was approximately $26,600
    - Assuming a COLA provision of the lesser of 3% of the benefit and $300 annually
    - The average new retirement expected to receive an approximate 1% simple COLA

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Option Election Experience – Last 5 Years

- The table below shows the actual elections for the selected 8,587 retirements:

Equated Type	Optional Form	Count
Traditional	Straight Life Annuity	3,947
	50% Joint and Survivor	1,329
	75% Joint and Survivor	635
	100% Joint and Survivor	2,499
Social Security Equated	Straight Life Annuity	98
	50% Joint and Survivor	27
	75% Joint and Survivor	15
	100% Joint and Survivor	37
Total		**8,587**

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Option Factor Analysis

- Next step was to develop actuarial equivalent option factors based upon the recently adopted actuarial assumptions and option election experience from the past 5 years
- Recommending cost associated with COLA provisions be included in the factor development
- Recommending cost associated with joint and survivor pop-up feature be included in the factor development

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Option Factor Analysis

- Proposed factors are based upon the following:
  - Investment return assumption of 6.75%
  - COLA assumption: 1.0%
  - Newly adopted post-retirement mortality assumptions
    - RP-2014 Healthy Annuitant Mortality Tables scaled by 93% for males and 98% for females, adjusted for mortality improvements using projection scale MP-2017 from 2006
    - Calculation year of 2021
  - Unisex percent of 60% (i.e., participant assumed 60% male and 40% female)
  - Pop-up cost included

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Proposed 100% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	91.3%	91.8%	92.3%	92.8%	93.3%	93.8%	94.3%	94.7%	95.1%	95.5%	95.9%
51	90.7%	91.2%	91.8%	92.3%	92.8%	93.3%	93.8%	94.3%	94.8%	95.2%	95.6%
52	90.0%	90.6%	91.1%	91.7%	92.3%	92.8%	93.4%	93.9%	94.4%	94.8%	95.3%
53	89.2%	89.9%	90.5%	91.1%	91.7%	92.3%	92.8%	93.4%	93.9%	94.4%	94.9%
54	88.5%	89.1%	89.8%	90.4%	91.1%	91.7%	92.3%	92.9%	93.5%	94.0%	94.5%
55	87.6%	88.3%	89.0%	89.7%	90.4%	91.0%	91.7%	92.3%	93.0%	93.5%	94.1%
56	86.8%	87.5%	88.2%	88.9%	89.6%	90.4%	91.1%	91.7%	92.4%	93.0%	93.6%
57	85.8%	86.6%	87.3%	88.1%	88.8%	89.6%	90.4%	91.1%	91.8%	92.5%	93.1%
58	84.9%	85.6%	86.4%	87.2%	88.0%	88.8%	89.6%	90.4%	91.2%	91.9%	92.6%
59	83.8%	84.6%	85.4%	86.3%	87.1%	88.0%	88.8%	89.6%	90.5%	91.2%	92.0%
60	82.7%	83.5%	84.4%	85.2%	86.1%	87.0%	87.9%	88.8%	89.7%	90.5%	91.4%
61	81.6%	82.4%	83.3%	84.2%	85.1%	86.1%	87.0%	88.0%	88.9%	89.8%	90.7%
62	80.4%	81.2%	82.1%	83.1%	84.0%	85.0%	86.0%	87.0%	88.0%	89.0%	89.9%
63	79.1%	80.0%	80.9%	81.9%	82.9%	83.9%	85.0%	86.0%	87.1%	88.1%	89.1%
64	77.8%	78.7%	79.6%	80.6%	81.7%	82.7%	83.8%	84.9%	86.0%	87.2%	88.2%
65	76.4%	77.3%	78.3%	79.3%	80.4%	81.5%	82.6%	83.8%	85.0%	86.1%	87.3%
66	75.0%	75.9%	76.9%	77.9%	79.0%	80.1%	81.3%	82.6%	83.8%	85.0%	86.3%
67	73.5%	74.4%	75.4%	76.4%	77.6%	78.7%	80.0%	81.2%	82.5%	83.8%	85.1%
68	71.9%	72.8%	73.8%	74.9%	76.0%	77.3%	78.5%	79.8%	81.2%	82.6%	83.9%
69	70.3%	71.2%	72.2%	73.3%	74.5%	75.7%	77.0%	78.3%	79.7%	81.2%	82.6%
70	68.6%	69.5%	70.5%	71.6%	72.8%	74.0%	75.4%	76.8%	78.2%	79.7%	81.2%

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Proposed 75% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	93.3%	93.7%	94.1%	94.5%	94.9%	95.3%	95.6%	96.0%	96.3%	96.6%	96.9%
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54	91.1%	91.6%	92.1%	92.6%	93.1%	93.6%	94.1%	94.6%	95.0%	95.4%	95.8%
55	90.4%	91.0%	91.5%	92.1%	92.6%	93.1%	93.6%	94.1%	94.6%	95.1%	95.5%
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59	87.4%	88.0%	88.6%	89.3%	90.0%	90.7%	91.4%	92.0%	92.7%	93.3%	93.9%
60	86.5%	87.1%	87.8%	88.5%	89.2%	90.0%	90.7%	91.4%	92.1%	92.7%	93.4%
61	85.5%	86.2%	86.9%	87.7%	88.4%	89.2%	89.9%	90.7%	91.4%	92.1%	92.8%
62	84.5%	85.2%	86.0%	86.7%	87.5%	88.3%	89.1%	89.9%	90.7%	91.5%	92.2%
63	83.5%	84.2%	85.0%	85.8%	86.6%	87.4%	88.3%	89.1%	90.0%	90.8%	91.6%
64	82.4%	83.1%	83.9%	84.7%	85.6%	86.5%	87.4%	88.3%	89.2%	90.0%	90.9%
65	81.2%	82.0%	82.8%	83.6%	84.5%	85.4%	86.4%	87.3%	88.3%	89.2%	90.1%
66	80.0%	80.8%	81.6%	82.5%	83.4%	84.3%	85.3%	86.3%	87.3%	88.3%	89.3%
67	78.7%	79.5%	80.3%	81.2%	82.2%	83.2%	84.2%	85.2%	86.3%	87.4%	88.4%
68	77.4%	78.1%	79.0%	79.9%	80.9%	81.9%	83.0%	84.1%	85.2%	86.3%	87.4%
69	75.9%	76.7%	77.6%	78.5%	79.5%	80.6%	81.7%	82.8%	84.0%	85.2%	86.4%
70	74.4%	75.3%	76.1%	77.1%	78.1%	79.2%	80.3%	81.5%	82.7%	84.0%	85.2%

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Proposed 50% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	95.4%	95.7%	96.0%	96.3%	96.5%	96.8%	97.0%	97.3%	97.5%	97.7%	97.9%
51	95.1%	95.4%	95.7%	96.0%	96.3%	96.6%	96.8%	97.1%	97.3%	97.5%	97.8%
52	94.7%	95.0%	95.4%	95.7%	96.0%	96.3%	96.6%	96.8%	97.1%	97.3%	97.6%
53	94.3%	94.7%	95.0%	95.3%	95.7%	96.0%	96.3%	96.6%	96.9%	97.1%	97.4%
54	93.9%	94.2%	94.6%	95.0%	95.3%	95.7%	96.0%	96.3%	96.6%	96.9%	97.2%
55	93.4%	93.8%	94.2%	94.6%	94.9%	95.3%	95.7%	96.0%	96.3%	96.7%	97.0%
56	92.9%	93.3%	93.7%	94.1%	94.5%	94.9%	95.3%	95.7%	96.0%	96.4%	96.7%
57	92.4%	92.8%	93.2%	93.7%	94.1%	94.5%	94.9%	95.3%	95.7%	96.1%	96.4%
58	91.8%	92.3%	92.7%	93.2%	93.6%	94.1%	94.5%	95.0%	95.4%	95.8%	96.2%
59	91.2%	91.7%	92.1%	92.6%	93.1%	93.6%	94.1%	94.5%	95.0%	95.4%	95.8%
60	90.6%	91.0%	91.5%	92.0%	92.6%	93.1%	93.6%	94.1%	94.6%	95.0%	95.5%
61	89.9%	90.4%	90.9%	91.4%	92.0%	92.5%	93.1%	93.6%	94.1%	94.6%	95.1%
62	89.1%	89.6%	90.2%	90.7%	91.3%	91.9%	92.5%	93.1%	93.6%	94.2%	94.7%
63	88.3%	88.9%	89.4%	90.0%	90.6%	91.2%	91.9%	92.5%	93.1%	93.7%	94.2%
64	87.5%	88.1%	88.7%	89.3%	89.9%	90.5%	91.2%	91.9%	92.5%	93.1%	93.7%
65	86.6%	87.2%	87.8%	88.5%	89.1%	89.8%	90.5%	91.2%	91.9%	92.5%	93.2%
66	85.7%	86.3%	86.9%	87.6%	88.3%	89.0%	89.7%	90.4%	91.2%	91.9%	92.6%
67	84.7%	85.3%	86.0%	86.6%	87.4%	88.1%	88.9%	89.6%	90.4%	91.2%	92.0%
68	83.7%	84.3%	84.9%	85.7%	86.4%	87.2%	88.0%	88.8%	89.6%	90.4%	91.3%
69	82.6%	83.2%	83.9%	84.6%	85.4%	86.2%	87.0%	87.9%	88.7%	89.6%	90.5%
70	81.4%	82.0%	82.7%	83.5%	84.3%	85.1%	86.0%	86.9%	87.8%	88.7%	89.6%

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Proposed Social Security Equated Factors

- The table below shows the proposed Social Security equated optional form factors at integer ages only

Retiree Age	Factor
40	13.97%
41	14.99%
42	16.08%
43	17.27%
44	18.55%
45	19.93%
46	21.43%
47	23.06%
48	24.82%
49	26.74%
50	28.82%
51	31.08%
52	33.55%

Retiree Age	Factor
53	36.25%
54	39.19%
55	42.42%
56	45.95%
57	49.84%
58	54.11%
59	58.81%
60	64.01%
61	69.77%
62	76.15%
63	83.25%
64	91.16%

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Option Factor Analysis

- Proposed decrease in interest rate, inclusion of COLA, and inclusion of pop-up feature typically increase the cost of the optional form to participant
- For all age combinations studied (ages 50-70 retiree and beneficiary), analysis indicates that the participant will be charged less for optional form payments under proposed assumptions
- Source of the reduction attributable to longer life expectancy
  - Updated mortality tables
  - Unisex blending consistent with actual gender mix of those making elections
- Exhibits on the following slides show deltas (changes) in the factors (proposed – current)
  - Positive numbers indicate a lower pension adjustment than under the current tables
  - Negative numbers indicate a higher pension adjustment than under the current tables

Proposed 100% Factor Deltas

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.2%	0.1%	0.1%	0.1%
51	0.6%	0.5%	0.6%	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%
52	0.7%	0.7%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%	0.4%	0.3%	0.3%
53	0.7%	0.8%	0.8%	0.8%	0.7%	0.7%	0.6%	0.6%	0.5%	0.4%	0.3%
54	0.9%	0.9%	1.0%	0.9%	0.9%	0.8%	0.8%	0.7%	0.7%	0.5%	0.5%
55	1.0%	1.0%	1.1%	1.1%	1.1%	0.9%	0.9%	0.8%	0.8%	0.6%	0.6%
56	1.2%	1.3%	1.3%	1.2%	1.2%	1.2%	1.1%	1.0%	0.9%	0.8%	0.7%
57	1.4%	1.4%	1.4%	1.4%	1.4%	1.3%	1.3%	1.2%	1.1%	1.0%	0.9%
58	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.5%	1.4%	1.4%	1.3%	1.2%
59	1.8%	1.8%	1.9%	1.9%	1.9%	1.9%	1.8%	1.6%	1.6%	1.5%	1.4%
60	2.0%	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	1.9%	1.9%	1.7%	1.7%
61	2.3%	2.3%	2.4%	2.4%	2.4%	2.4%	2.3%	2.3%	2.2%	2.1%	2.0%
62	2.6%	2.6%	2.6%	2.7%	2.7%	2.7%	2.6%	2.6%	2.5%	2.4%	2.3%
63	2.8%	2.9%	3.0%	3.0%	3.0%	3.0%	3.0%	2.9%	2.9%	2.7%	2.6%
64	3.1%	3.2%	3.2%	3.3%	3.4%	3.3%	3.3%	3.2%	3.1%	3.2%	3.0%
65	3.4%	3.5%	3.6%	3.6%	3.7%	3.7%	3.6%	3.6%	3.6%	3.4%	3.4%
66	3.7%	3.8%	3.9%	3.9%	3.9%	3.9%	3.9%	4.0%	3.9%	3.8%	3.8%
67	3.9%	4.0%	4.1%	4.1%	4.2%	4.2%	4.2%	4.2%	4.2%	4.1%	4.0%
68	4.1%	4.2%	4.3%	4.3%	4.4%	4.5%	4.4%	4.4%	4.5%	4.5%	4.4%
69	4.3%	4.4%	4.5%	4.5%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.6%
70	4.4%	4.5%	4.6%	4.7%	4.8%	4.8%	4.9%	4.9%	4.9%	4.9%	4.9%

Positive delta means the pension adjustment will be lower than under the current tables.

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Proposed 75% Factor Deltas

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.1%	0.1%	0.1%
51	0.4%	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%
52	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%
53	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.4%	0.5%	0.4%	0.4%	0.2%
54	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.5%	0.4%	0.3%
55	0.8%	0.9%	0.8%	0.9%	0.8%	0.7%	0.7%	0.6%	0.6%	0.6%	0.5%
56	0.9%	1.0%	1.0%	0.9%	0.9%	0.9%	0.8%	0.8%	0.7%	0.7%	0.6%
57	1.1%	1.2%	1.2%	1.2%	1.1%	1.1%	1.0%	1.0%	0.9%	0.9%	0.8%
58	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.2%	1.1%	1.0%	1.0%	0.9%
59	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.4%	1.3%	1.3%	1.2%	1.1%
60	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.6%	1.5%	1.4%	1.3%
61	1.9%	1.9%	2.0%	2.0%	2.0%	2.0%	1.8%	1.8%	1.7%	1.6%	1.5%
62	2.1%	2.2%	2.2%	2.2%	2.2%	2.2%	2.1%	2.0%	2.0%	1.9%	1.8%
63	2.4%	2.4%	2.5%	2.5%	2.5%	2.4%	2.4%	2.3%	2.3%	2.2%	2.1%
64	2.7%	2.7%	2.7%	2.7%	2.8%	2.8%	2.8%	2.7%	2.6%	2.5%	2.4%
65	2.9%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.9%	2.9%	2.8%	2.7%
66	3.2%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.2%	3.2%	3.1%	3.0%
67	3.4%	3.5%	3.5%	3.5%	3.6%	3.6%	3.6%	3.5%	3.5%	3.4%	3.3%
68	3.7%	3.6%	3.7%	3.7%	3.8%	3.8%	3.8%	3.8%	3.7%	3.7%	3.6%
69	3.8%	3.8%	3.9%	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	3.9%	3.9%
70	3.9%	4.1%	4.1%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.1%

Positive delta means the pension adjustment will be lower than under the current tables.

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Proposed 50% Factor Deltas

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	0.2%	0.2%	0.2%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%	0.0%
51	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.1%	0.1%	0.1%
52	0.3%	0.3%	0.4%	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%	0.1%	0.2%
53	0.4%	0.5%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%
54	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%
55	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%
56	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.4%
57	0.8%	0.8%	0.8%	0.8%	0.8%	0.7%	0.7%	0.6%	0.6%	0.6%	0.5%
58	0.9%	1.0%	1.0%	1.0%	0.9%	0.9%	0.8%	0.8%	0.8%	0.7%	0.7%
59	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.0%	0.9%	0.9%	0.8%	0.7%
60	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	1.2%	1.1%	1.1%	0.9%	0.9%
61	1.5%	1.5%	1.5%	1.4%	1.5%	1.4%	1.4%	1.3%	1.2%	1.1%	1.1%
62	1.6%	1.6%	1.7%	1.6%	1.6%	1.6%	1.6%	1.5%	1.4%	1.4%	1.3%
63	1.8%	1.9%	1.8%	1.8%	1.8%	1.8%	1.8%	1.7%	1.7%	1.6%	1.5%
64	2.0%	2.1%	2.1%	2.1%	2.0%	2.0%	2.0%	2.0%	1.9%	1.8%	1.7%
65	2.2%	2.3%	2.3%	2.3%	2.3%	2.3%	2.2%	2.2%	2.1%	2.0%	1.9%
66	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.4%	2.4%	2.4%	2.3%	2.2%
67	2.7%	2.7%	2.7%	2.7%	2.8%	2.7%	2.7%	2.6%	2.5%	2.5%	2.5%
68	2.9%	2.9%	2.9%	3.0%	2.9%	2.9%	2.9%	2.8%	2.8%	2.7%	2.7%
69	3.1%	3.1%	3.1%	3.1%	3.2%	3.1%	3.1%	3.1%	3.0%	2.9%	2.9%
70	3.2%	3.2%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.2%	3.1%	3.0%

Positive delta means the pension adjustment will be lower than under the current tables.

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Proposed Social Security Equated Deltas

- The table below shows the deltas associated with adopting the proposed Social Security equated optional form factors at integer ages only

Retiree Age	Factor
40	5.90%
41	5.60%
42	5.37%
43	5.24%
44	5.20%
45	5.26%
46	5.84%
47	5.62%
48	5.79%
49	5.95%
50	6.10%
51	6.23%
52	6.34%

Retiree Age	Factor
53	6.43%
54	6.47%
55	6.48%
56	6.43%
57	6.33%
58	6.13%
59	5.82%
60	5.40%
61	4.82%
62	4.04%
63	3.02%
64	1.70%

Conclusion

- We recommend adoption of the proposed optional form tables based on the following assumptions:
  - 6.75% interest rate
  - Mortality tables based on those previously adopted in conjunction with the 2012-2017 SERS experience study
  - Inclusion of the cost of the COLA feature
  - Inclusion of the cost of the pop-up feature for the joint and survivor options
  - Unisex blending consistent with recent actual optional form election information

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Disclosures

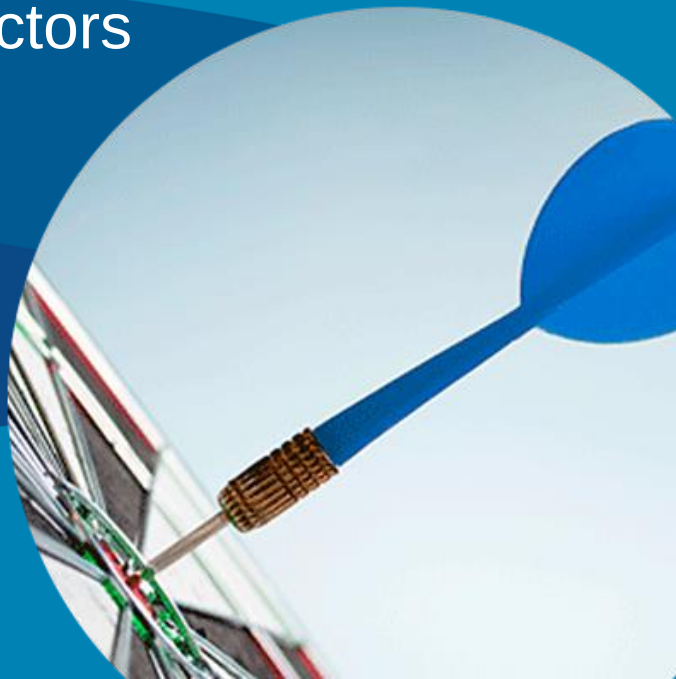
- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- Mita Drazilov and Louise Gates are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.
- If you need additional information to make an informed decision about the contents of this presentation, or if anything appears to be missing or incomplete please contact us before using this presentation.

GRS Retirement Consulting

Michigan Judges Retirement System (JRS)

Review of Optional Forms of Payment Factors

November 1, 2018



Introduction

- Normal form of payment for a member who retires varies:
  - If married at retirement: 50% joint and survivor
  - If not married at retirement: a straight life benefit
- Section 506 of the JRS statute allows the member to choose an optional form of payment by having the member's computed benefit reduced
  - 100% joint and survivor with pop-up
  - 50% joint and survivor with pop-up
- If a member chooses an optional form of payment, an "option factor" is applied to the member's computed benefit

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Introduction (Continued)

- Section 506 of the JRS statute indicates that the joint and survivor options shall be the "actuarial equivalent" of the straight life option
  - Actuarial equivalent means that the optional forms of payment are "cost neutral" based upon a set of actuarial assumptions
  - That is, if all assumptions that the option factors are based upon are met, JRS is not financially affected by the selection of payment form by the member

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Introduction (Continued)

- Actuarial equivalent (i.e., cost neutral) option factors are generally dependent upon the following:
  - Life expectancies of the retiree and beneficiary
  - Interest rate assumption
  - COLA assumption
  - Proportion of male/female retirees choosing the options
    - Cannot charge a different option factor based upon a member's gender

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Introduction (Continued)

- Public Act 335 of 2018 grants the Department and the Retirement Board the authority to set the assumed rate of return and mortality tables associated with actuarial equivalence for optional forms of payment
- Reasonable to review the option factors based upon the results of the recently completed 5-year Experience Study to see if the option factors should be updated

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Introduction (Concluded)

- The choice of a set of option factors is based upon judgement
  - Considerations include:
    - System's objectives
    - Anti-selection
    - Whether the proposed factors are different enough to pursue a change
- The choice of assumptions may affect other individual actuarial calculations such as EDROs, recoupment calculations, and service purchases

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Current Option Factors

- ORS provided the joint and survivor and the Social Security equated optional form factors currently in use
  - ORS currently uses the same joint and survivor optional form factors for all systems (i.e., MPSERS, SERS, SPRS, and JRS)
- GRS reasonably approximated the current joint and survivor factors using the following actuarial basis:
  - 8.00% interest rate
  - 1983 Group Annuity Mortality Table
  - 100% unisex (i.e., retiree assumed to be 100% male; beneficiary the opposite)
  - No COLA
  - No charge for the pop-up provision

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Current 100% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	90.9%	91.4%	91.9%	92.4%	93.0%	93.5%	94.0%	94.5%	95.0%	95.4%	95.8%
51	90.1%	90.7%	91.2%	91.8%	92.4%	92.9%	93.5%	94.0%	94.5%	95.0%	95.4%
52	89.3%	89.9%	90.5%	91.1%	91.7%	92.3%	92.9%	93.4%	94.0%	94.5%	95.0%
53	88.5%	89.1%	89.7%	90.3%	91.0%	91.6%	92.2%	92.8%	93.4%	94.0%	94.6%
54	87.6%	88.2%	88.8%	89.5%	90.2%	90.9%	91.5%	92.2%	92.8%	93.5%	94.0%
55	86.6%	87.3%	87.9%	88.6%	89.3%	90.1%	90.8%	91.5%	92.2%	92.9%	93.5%
56	85.6%	86.2%	86.9%	87.7%	88.4%	89.2%	90.0%	90.7%	91.5%	92.2%	92.9%
57	84.4%	85.2%	85.9%	86.7%	87.4%	88.3%	89.1%	89.9%	90.7%	91.5%	92.2%
58	83.3%	84.0%	84.8%	85.6%	86.4%	87.2%	88.1%	89.0%	89.8%	90.6%	91.4%
59	82.0%	82.8%	83.5%	84.4%	85.2%	86.1%	87.0%	88.0%	88.9%	89.7%	90.6%
60	80.7%	81.4%	82.3%	83.1%	84.0%	84.9%	85.9%	86.9%	87.8%	88.8%	89.7%
61	79.3%	80.1%	80.9%	81.8%	82.7%	83.7%	84.7%	85.7%	86.7%	87.7%	88.7%
62	77.8%	78.6%	79.5%	80.4%	81.3%	82.3%	83.4%	84.4%	85.5%	86.6%	87.6%
63	76.3%	77.1%	77.9%	78.9%	79.9%	80.9%	82.0%	83.1%	84.2%	85.4%	86.5%
64	74.7%	75.5%	76.4%	77.3%	78.3%	79.4%	80.5%	81.7%	82.9%	84.0%	85.2%
65	73.0%	73.8%	74.7%	75.7%	76.7%	77.8%	79.0%	80.2%	81.4%	82.7%	83.9%
66	71.3%	72.1%	73.0%	74.0%	75.1%	76.2%	77.4%	78.6%	79.9%	81.2%	82.5%
67	69.6%	70.4%	71.3%	72.3%	73.4%	74.5%	75.8%	77.0%	78.3%	79.7%	81.1%
68	67.8%	68.6%	69.5%	70.6%	71.6%	72.8%	74.1%	75.4%	76.7%	78.1%	79.5%
69	66.0%	66.8%	67.7%	68.8%	69.8%	71.0%	72.3%	73.6%	75.0%	76.5%	78.0%
70	64.2%	65.0%	65.9%	66.9%	68.0%	69.2%	70.5%	71.9%	73.3%	74.8%	76.3%

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Current 50% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	95.2%	95.5%	95.8%	96.1%	96.4%	96.6%	96.9%	97.2%	97.4%	97.6%	97.9%
51	94.8%	95.1%	95.4%	95.7%	96.0%	96.3%	96.6%	96.9%	97.2%	97.4%	97.7%
52	94.4%	94.7%	95.0%	95.3%	95.7%	96.0%	96.3%	96.6%	96.9%	97.2%	97.4%
53	93.9%	94.2%	94.6%	94.9%	95.3%	95.6%	96.0%	96.3%	96.6%	96.9%	97.2%
54	93.4%	93.7%	94.1%	94.5%	94.8%	95.2%	95.6%	95.9%	96.3%	96.6%	96.9%
55	92.8%	93.2%	93.6%	94.0%	94.4%	94.8%	95.2%	95.6%	95.9%	96.3%	96.6%
56	92.2%	92.6%	93.0%	93.4%	93.9%	94.3%	94.7%	95.1%	95.5%	95.9%	96.3%
57	91.6%	92.0%	92.4%	92.9%	93.3%	93.8%	94.2%	94.7%	95.1%	95.5%	95.9%
58	90.9%	91.3%	91.7%	92.2%	92.7%	93.2%	93.7%	94.2%	94.6%	95.1%	95.5%
59	90.1%	90.6%	91.0%	91.5%	92.0%	92.5%	93.1%	93.6%	94.1%	94.6%	95.1%
60	89.3%	89.8%	90.3%	90.8%	91.3%	91.9%	92.4%	93.0%	93.5%	94.1%	94.6%
61	88.4%	88.9%	89.4%	90.0%	90.5%	91.1%	91.7%	92.3%	92.9%	93.5%	94.0%
62	87.5%	88.0%	88.5%	89.1%	89.7%	90.3%	90.9%	91.6%	92.2%	92.8%	93.4%
63	86.5%	87.0%	87.6%	88.2%	88.8%	89.4%	90.1%	90.8%	91.4%	92.1%	92.7%
64	85.5%	86.0%	86.6%	87.2%	87.9%	88.5%	89.2%	89.9%	90.6%	91.3%	92.0%
65	84.4%	84.9%	85.5%	86.2%	86.8%	87.5%	88.3%	89.0%	89.8%	90.5%	91.3%
66	83.2%	83.8%	84.4%	85.1%	85.8%	86.5%	87.3%	88.0%	88.8%	89.6%	90.4%
67	82.0%	82.6%	83.3%	83.9%	84.6%	85.4%	86.2%	87.0%	87.9%	88.7%	89.5%
68	80.8%	81.4%	82.0%	82.7%	83.5%	84.3%	85.1%	86.0%	86.8%	87.7%	88.6%
69	79.5%	80.1%	80.8%	81.5%	82.2%	83.1%	83.9%	84.8%	85.7%	86.7%	87.6%
70	78.2%	78.8%	79.4%	80.2%	81.0%	81.8%	82.7%	83.6%	84.6%	85.6%	86.6%

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Example

- Member retires at age 60 with a $10,000 annual benefit
  - Spouse is the same age
  - Member chooses 100% joint and survivor with pop-up
  - Member's benefit becomes $8,490 ($10,000 x 84.9%)
    - Reduction in member's benefit of $1,510 makes up for the longer period of time over which the pension is expected to be paid
    - If member predeceases spouse, spouse receives $8,490 (COLAs would affect actual benefit at time of death)
    - If spouse predeceases member, member's benefit increases (i.e., pops-up) to $10,000 (COLAs would affect actual benefit at time of death)

Option Election Experience – Last 5 Years

- GRS analyzed all service-based retirements contained in the September 30, 2017 actuarial valuation data
  - No death-in-service or disability retirements considered
  - Only considered records in which retiree was still alive
  - 340 retirements met above criteria

Option Election Experience – Last 5 Years

- The results are as follows:
  - Very few retirees elect optional forms of payment (approximately 84% of the retirements studied elected the default payment option)
  - Of the few that selected an optional form of payment, approximately 90% were male, electing the 100% joint and survivor option

Option Factor Analysis

- Next step was to develop actuarial equivalent option factors based upon the recently adopted actuarial assumptions and option election experience from the past 5 years
- Recommending cost associated with joint and survivor pop-up feature be included in the factor development

Option Factor Analysis

- Proposed factors are based upon the following:
  - Investment return assumption of 6.75%
  - No COLA assumption
  - Newly adopted post-retirement mortality assumptions
    - RP-2014 Healthy Annuitant Mortality Tables scaled by 100% for males and 100% for females, adjusted for mortality improvements using projection scale MP-2017 from 2006
    - Calculation year of 2021
  - Unisex percent of 90% (i.e., participant assumed 90% male and 10% female)
  - Pop-up cost included

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Proposed 100% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	91.2%	91.6%	92.1%	92.5%	93.0%	93.4%	93.9%	94.3%	94.7%	95.1%	95.5%
51	90.5%	91.0%	91.5%	92.0%	92.5%	93.0%	93.4%	93.9%	94.3%	94.8%	95.2%
52	89.9%	90.4%	90.9%	91.4%	91.9%	92.4%	93.0%	93.4%	93.9%	94.4%	94.8%
53	89.2%	89.7%	90.2%	90.8%	91.3%	91.9%	92.4%	93.0%	93.5%	94.0%	94.5%
54	88.4%	89.0%	89.5%	90.1%	90.7%	91.3%	91.9%	92.4%	93.0%	93.5%	94.1%
55	87.6%	88.2%	88.8%	89.4%	90.0%	90.7%	91.3%	91.9%	92.5%	93.1%	93.6%
56	86.8%	87.4%	88.0%	88.6%	89.3%	90.0%	90.6%	91.3%	91.9%	92.5%	93.1%
57	85.9%	86.5%	87.1%	87.8%	88.5%	89.2%	89.9%	90.6%	91.3%	92.0%	92.6%
58	84.9%	85.6%	86.2%	86.9%	87.7%	88.4%	89.2%	89.9%	90.6%	91.3%	92.0%
59	83.9%	84.6%	85.3%	86.0%	86.8%	87.6%	88.3%	89.1%	89.9%	90.7%	91.4%
60	82.8%	83.5%	84.3%	85.0%	85.8%	86.6%	87.5%	88.3%	89.1%	90.0%	90.8%
61	81.7%	82.4%	83.2%	84.0%	84.8%	85.7%	86.5%	87.4%	88.3%	89.2%	90.1%
62	80.5%	81.3%	82.1%	82.9%	83.7%	84.6%	85.5%	86.5%	87.4%	88.4%	89.3%
63	79.3%	80.1%	80.9%	81.7%	82.6%	83.5%	84.5%	85.5%	86.5%	87.5%	88.4%
64	78.0%	78.8%	79.6%	80.5%	81.4%	82.4%	83.4%	84.4%	85.4%	86.5%	87.5%
65	76.7%	77.4%	78.3%	79.2%	80.1%	81.1%	82.2%	83.2%	84.3%	85.4%	86.6%
66	75.3%	76.0%	76.9%	77.8%	78.8%	79.8%	80.9%	82.0%	83.2%	84.3%	85.5%
67	73.8%	74.6%	75.4%	76.4%	77.3%	78.4%	79.5%	80.7%	81.9%	83.1%	84.4%
68	72.3%	73.1%	73.9%	74.8%	75.9%	76.9%	78.1%	79.3%	80.5%	81.8%	83.1%
69	70.7%	71.5%	72.3%	73.3%	74.3%	75.4%	76.6%	77.8%	79.1%	80.4%	81.8%
70	69.0%	69.8%	70.7%	71.6%	72.6%	73.8%	75.0%	76.2%	77.6%	79.0%	80.4%

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Proposed 50% Joint and Survivor Factors

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	95.4%	95.6%	95.9%	96.1%	96.4%	96.6%	96.8%	97.1%	97.3%	97.5%	97.7%
51	95.0%	95.3%	95.6%	95.8%	96.1%	96.4%	96.6%	96.9%	97.1%	97.3%	97.5%
52	94.7%	94.9%	95.2%	95.5%	95.8%	96.1%	96.3%	96.6%	96.9%	97.1%	97.4%
53	94.3%	94.6%	94.9%	95.2%	95.5%	95.8%	96.1%	96.4%	96.6%	96.9%	97.2%
54	93.8%	94.2%	94.5%	94.8%	95.1%	95.5%	95.8%	96.1%	96.4%	96.7%	96.9%
55	93.4%	93.7%	94.1%	94.4%	94.8%	95.1%	95.4%	95.8%	96.1%	96.4%	96.7%
56	92.9%	93.3%	93.6%	94.0%	94.3%	94.7%	95.1%	95.4%	95.8%	96.1%	96.4%
57	92.4%	92.8%	93.1%	93.5%	93.9%	94.3%	94.7%	95.1%	95.4%	95.8%	96.2%
58	91.8%	92.2%	92.6%	93.0%	93.4%	93.9%	94.3%	94.7%	95.1%	95.5%	95.9%
59	91.2%	91.6%	92.1%	92.5%	92.9%	93.4%	93.8%	94.3%	94.7%	95.1%	95.5%
60	90.6%	91.0%	91.5%	91.9%	92.4%	92.8%	93.3%	93.8%	94.3%	94.7%	95.2%
61	89.9%	90.4%	90.8%	91.3%	91.8%	92.3%	92.8%	93.3%	93.8%	94.3%	94.8%
62	89.2%	89.7%	90.1%	90.6%	91.1%	91.7%	92.2%	92.8%	93.3%	93.8%	94.3%
63	88.5%	88.9%	89.4%	89.9%	90.5%	91.0%	91.6%	92.2%	92.7%	93.3%	93.9%
64	87.7%	88.1%	88.6%	89.2%	89.7%	90.3%	90.9%	91.5%	92.1%	92.8%	93.4%
65	86.8%	87.3%	87.8%	88.4%	89.0%	89.6%	90.2%	90.8%	91.5%	92.2%	92.8%
66	85.9%	86.4%	86.9%	87.5%	88.1%	88.8%	89.4%	90.1%	90.8%	91.5%	92.2%
67	84.9%	85.4%	86.0%	86.6%	87.2%	87.9%	88.6%	89.3%	90.0%	90.8%	91.5%
68	83.9%	84.4%	85.0%	85.6%	86.3%	87.0%	87.7%	88.4%	89.2%	90.0%	90.8%
69	82.8%	83.4%	83.9%	84.6%	85.2%	86.0%	86.7%	87.5%	88.3%	89.2%	90.0%
70	81.7%	82.2%	82.8%	83.5%	84.2%	84.9%	85.7%	86.5%	87.4%	88.2%	89.1%

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Option Factor Analysis

- Proposed decrease in interest rate and inclusion of pop-up feature typically increase the cost of the optional form to participant
- For most of the age combinations studied (ages 50-70 retiree and beneficiary), analysis indicates that the participant will be charged less for optional form payments under proposed assumptions
- Source of the reduction attributable to longer life expectancy
  - Updated mortality tables
  - Unisex blending consistent with actual gender mix of those making elections
- Exhibits on the following slides show deltas (changes) in the factors (proposed – current)
  - Positive numbers indicate a lower pension adjustment than under the current tables
  - Negative numbers indicate a higher pension adjustment than under the current tables

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Proposed 100% Factor Deltas

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	0.3%	0.2%	0.2%	0.1%	0.0%	-0.1%	-0.1%	-0.2%	-0.3%	-0.3%	-0.3%
51	0.4%	0.3%	0.3%	0.2%	0.1%	0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%
52	0.6%	0.5%	0.4%	0.3%	0.2%	0.1%	0.1%	0.0%	-0.1%	-0.1%	-0.2%
53	0.7%	0.6%	0.5%	0.5%	0.3%	0.3%	0.2%	0.2%	0.1%	0.0%	-0.1%
54	0.8%	0.8%	0.7%	0.6%	0.5%	0.4%	0.4%	0.2%	0.2%	0.0%	0.1%
55	1.0%	0.9%	0.9%	0.8%	0.7%	0.6%	0.5%	0.4%	0.3%	0.2%	0.1%
56	1.2%	1.2%	1.1%	0.9%	0.9%	0.8%	0.6%	0.6%	0.4%	0.3%	0.2%
57	1.5%	1.3%	1.2%	1.1%	1.1%	0.9%	0.8%	0.7%	0.6%	0.5%	0.4%
58	1.6%	1.6%	1.4%	1.3%	1.3%	1.2%	1.1%	0.9%	0.8%	0.7%	0.6%
59	1.9%	1.8%	1.8%	1.6%	1.6%	1.5%	1.3%	1.1%	1.0%	1.0%	0.8%
60	2.1%	2.1%	2.0%	1.9%	1.8%	1.7%	1.6%	1.4%	1.3%	1.2%	1.1%
61	2.4%	2.3%	2.3%	2.2%	2.1%	2.0%	1.8%	1.7%	1.6%	1.5%	1.4%
62	2.7%	2.7%	2.6%	2.5%	2.4%	2.3%	2.1%	2.1%	1.9%	1.8%	1.7%
63	3.0%	3.0%	3.0%	2.8%	2.7%	2.6%	2.5%	2.4%	2.3%	2.1%	1.9%
64	3.3%	3.3%	3.2%	3.2%	3.1%	3.0%	2.9%	2.7%	2.5%	2.5%	2.3%
65	3.7%	3.6%	3.6%	3.5%	3.4%	3.3%	3.2%	3.0%	2.9%	2.7%	2.7%
66	4.0%	3.9%	3.9%	3.8%	3.7%	3.6%	3.5%	3.4%	3.3%	3.1%	3.0%
67	4.2%	4.2%	4.1%	4.1%	3.9%	3.9%	3.7%	3.7%	3.6%	3.4%	3.3%
68	4.5%	4.5%	4.4%	4.2%	4.3%	4.1%	4.0%	3.9%	3.8%	3.7%	3.6%
69	4.7%	4.7%	4.6%	4.5%	4.5%	4.4%	4.3%	4.2%	4.1%	3.9%	3.8%
70	4.8%	4.8%	4.8%	4.7%	4.6%	4.6%	4.5%	4.3%	4.3%	4.2%	4.1%

Positive delta means the pension adjustment will be lower than under the current tables.

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Proposed 50% Factor Deltas

	Beneficiary Age										
Retiree Age	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**
50	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.2%
51	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	-0.1%	-0.1%	-0.2%
52	0.3%	0.2%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%
53	0.4%	0.4%	0.3%	0.3%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%
54	0.4%	0.5%	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%	0.1%	0.1%	0.0%
55	0.6%	0.5%	0.5%	0.4%	0.4%	0.3%	0.2%	0.2%	0.2%	0.1%	0.1%
56	0.7%	0.7%	0.6%	0.6%	0.4%	0.4%	0.4%	0.3%	0.3%	0.2%	0.1%
57	0.8%	0.8%	0.7%	0.6%	0.6%	0.5%	0.5%	0.4%	0.3%	0.3%	0.3%
58	0.9%	0.9%	0.9%	0.8%	0.7%	0.7%	0.6%	0.5%	0.5%	0.4%	0.4%
59	1.1%	1.0%	1.1%	1.0%	0.9%	0.9%	0.7%	0.7%	0.6%	0.5%	0.4%
60	1.3%	1.2%	1.2%	1.1%	1.1%	0.9%	0.9%	0.8%	0.8%	0.6%	0.6%
61	1.5%	1.5%	1.4%	1.3%	1.3%	1.2%	1.1%	1.0%	0.9%	0.8%	0.8%
62	1.7%	1.7%	1.6%	1.5%	1.4%	1.4%	1.3%	1.2%	1.1%	1.0%	0.9%
63	2.0%	1.9%	1.8%	1.7%	1.7%	1.6%	1.5%	1.4%	1.3%	1.2%	1.2%
64	2.2%	2.1%	2.0%	2.0%	1.8%	1.8%	1.7%	1.6%	1.5%	1.5%	1.4%
65	2.4%	2.4%	2.3%	2.2%	2.2%	2.1%	1.9%	1.8%	1.7%	1.7%	1.5%
66	2.7%	2.6%	2.5%	2.4%	2.3%	2.3%	2.1%	2.1%	2.0%	1.9%	1.8%
67	2.9%	2.8%	2.7%	2.7%	2.6%	2.5%	2.4%	2.3%	2.1%	2.1%	2.0%
68	3.1%	3.0%	3.0%	2.9%	2.8%	2.7%	2.6%	2.4%	2.4%	2.3%	2.2%
69	3.3%	3.3%	3.1%	3.1%	3.0%	2.9%	2.8%	2.7%	2.6%	2.5%	2.4%
70	3.5%	3.4%	3.4%	3.3%	3.2%	3.1%	3.0%	2.9%	2.8%	2.6%	2.5%

Positive delta means the pension adjustment will be lower than under the current tables.

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Conclusion

- We recommend adoption of the proposed optional form tables based on the following assumptions:
  - 6.75% interest rate
  - Mortality tables based on those previously adopted in conjunction with the 2012-2017 JRS experience study
  - Inclusion of the cost of the pop-up feature for the joint and survivor options
  - Unisex blending consistent with recent actual optional form election information

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Disclosures

- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
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